

# EXHIBIT G

## **Trace Evidence Unit**

### **Fabric, Fabric Damage, Fabric Impression, Duct Tape, and Cordage Examinations**

#### **1 Scope**

This document describes procedures used in the examination of fabric and cordage characterization, identification, and comparison in the Trace Evidence Unit (TEU). Examination of fabric damage, fabric impressions, and the fabric portion of duct tape are included in these procedures. The nature and extent of the evidence will determine the techniques used.

#### **2 Equipment/Materials/Reagents**

- Comparison microscope, magnification range from approximately 50x to approximately 600x
- Stereobinocular microscope, magnification range from approximately 2x to approximately 40x
- Forceps
- Spatula
- Scissors
- Probes
- Camera: digital
- Lux-o-lamp<sup>®</sup>
- Substrate for producing test damage *e.g.* Cardboard box or Styrofoam

#### **3 Standards and Controls**

Not applicable.

#### **4 Calibration**

Not applicable.

#### **5 Sampling**

Not applicable.

## **6 Procedure**

### **6.1 Fabric Examinations**

**6.1.1** Prior to a fabric analysis, specimens are typically processed utilizing the procedures outlined in TEU Evidence Processing Procedures.

**6.1.2** The general appearance, stains, size, shape, color, and condition of the pieces of fabric will be documented. The documentation will also include any cut, torn, crushed, or burned edges.

**6.1.3** Document the type of fabric i.e., woven, knit, or non-woven.

**6.1.4** Document if there are any identifying characteristics which may help identify the possible end use of the textile (trousers, jacket, etc.).

**6.1.5** Look for obvious gross characteristics which may serve to quickly eliminate the pieces of fabric as having come from a common source. These characteristics may include repeats, manufacturer's flaws, a missing portion of a printed design, a thicker yarn, stains, etc.

**6.1.6** Determine the size and shape of missing portion(s) from each of the fabrics, if possible. The size of the area missing from one piece of fabric should be equal to or greater than that of the other fabric.

**6.1.7** Determine the correct "side" or "face" of the fabric, if possible, and orient the warp and fill yarns (or courses and wales) in the same direction for comparison.

**6.1.8** Using gross characteristics such as irregular contours; different types, sizes, and colors of yarns; design patterns, and stain patterns, attempt to orient the pieces of fabric to one another.

**6.1.9** Determine if two pieces of fabric can be physically matched to one another.

**6.1.9.1** Once the pieces of fabric are oriented using gross characteristics, begin to compare individual yarns to one another, ensuring that the "long" yarns in one fabric coincide with the "short" yarns in the other piece of fabric. Continue comparing each yarn along the entire cut or torn edge.

**6.1.9.2** If all of the gross characteristics and all of the "long and short" yarns along the entire cut or torn edge of one piece of fabric can be associated to the second piece of fabric, it can be concluded that the two pieces of fabric physically match one another.

**6.1.9.3** Diagrams and/or photographs of the two pieces of fabric together will be taken and retained in the notes.

**6.1.9.4** If the two pieces of fabric physically fit together, they must also be alike in color, construction, and composition. Therefore, it can be concluded that the two pieces of fabric were once joined along their cut and/or torn edges, and no additional examinations are necessary.

**6.1.10** If two pieces of fabric cannot be physically matched to one another, determine if the two pieces of fabric exhibit the same color, construction, and composition.

**6.1.10.1** Document the number, size, color, and construction of the yarns in each direction for each piece of fabric.

**6.1.10.2** Document the direction of twist (S or Z) of the yarns (warp and fill) in both pieces of fabric.

**6.1.10.3** Analyze and identify the fibers comprising the fabric utilizing the procedures outlined in TEU Forensic Fiber Examinations.

**6.1.10.4** If no differences are observed between the pieces of fabric utilizing the appropriate techniques outlined above, it can be concluded that the pieces of fabric are consistent with originating from the same source or another source exhibiting the same color, construction, and composition.

## **6.2 Fabric Impression Examinations**

**6.2.1** Examination may be of the questioned item bearing the actual impression, a “lift” of an impression, a “cast” of an impression (from various types of surfaces, e.g. mud, glass, fender) or a photograph of an impression. If the actual item bearing the impression is submitted, first examine the item for the presence of trace evidence utilizing the procedures outlined in TEU Evidence Processing Procedures.

**6.2.1** Study the general shape of the impression, looking for identifying features that may help in the identification of the fabric type (*i.e.* twill, plain weave, knit, etc.) of the potential donor.

**6.2.2** Look for damaged areas on the fabric item (cuts, tears, snags) that may aid in orientation of the fabric and may add significance to the association.

**6.2.3** Make multiple impressions of the potential fabric donor on a suitable substrate such as ink or modeling clay, using different amounts of force or pressure.

**6.2.4** Compare the number of yarns or loops per inch in each direction for both the fabric specimen and the impression specimen. Document the results in the case notes.

**6.2.5** If no differences can be found between the known fabric and the questioned impression, it can be concluded that the fabric or another fabric of similar construction could have made the impression. The presence of individualizing or unusual characteristics such as cuts, tears, snags, etc., may allow for a positive identification to be made.

### **6.3 Fabric Damage Examination**

**6.3.1** Prior to a fabric damage analysis, specimens are typically processed utilizing the procedures outlined in TEU Evidence Processing Procedures. Document the fabric damage (i.e. length of cut/tears), any identifying features (i.e., single edged blade characteristic "V" shaped notch from the flat edge tearing the fabric), the shape of the cut/tear and any other characteristics observed.

**6.3.2** Test damage may be created after all other appropriate laboratory examinations (e.g. trace evidence, DNA, latent print) have been completed.

**6.3.2.1** Test damage will be made in an undamaged portion of the garment utilizing the questioned implement(s).

**6.3.2.2** The length, shape and overall pattern produced by the test damage will be compared to previously identified fabric damage.

**6.3.2.3** Photographs will be taken and maintained with the notes

**6.3.2.4** If no differences are observed between the test damage and the questioned fabric damage, it can be concluded that the identified fabric damage is consistent with having been made by the questioned implement or another similar implement.

### **6.4 Duct Tape Examinations**

**6.4.1** Prior to a duct tape analysis, specimens are typically processed utilizing the procedures outlined in TEU Evidence Processing Procedures.

**6.4.2** Duct tapes possess a backing material, adhesive and a fabric portion. The fabric portion of the duct tape is examined in TEU to determine color, construction and composition. The fabric portion is typically examined in TEU at the request of an examiner in the Chemistry Unit, who is responsible for the analysis of the remainder of the duct tape.

**6.4.3** Document the number, size, color and construction of yarns in each direction for each piece of fabric.

**6.4.4** Document direction of twist ("S", "Z" or "no twist") of the yarns (warp and fill) in both pieces of fabric.

**6.4.5** Analyze and identify the fibers present in each yarn utilizing the procedures outlined in TEU Forensic Fiber Examinations.

**6.4.6** If the portion received for analysis encompasses the entire width of the tape and at least 1 inch of the length of the tape, and if no differences are observed between the pieces of fabric utilizing the appropriate techniques outlined above, it can be concluded that the fabric portions of the duct tape are consistent with originating from the same source or another source exhibiting the

same color, construction, and composition.

**6.4.6.1** If the portion received for analysis does not encompass the entire width of the tape and at least 1 inch of the length of the tape, and if no differences are observed between the pieces of fabric utilizing the appropriate techniques outlined above, it can be concluded that the fabric comprising the pieces of tape exhibit the same color, construction and composition as one another, and therefore could have come from the same source. However, a statement should be added to the results identifying that the piece of tape received for analysis was not sufficient to fully characterize the tape.

## **6.5 Cordage Examinations**

**6.5.1** Prior to a cordage analysis, specimens are typically processed utilizing the procedures outlined in TEU Evidence Processing Procedures.

**6.5.2** Analyze and document the general appearance, stains, size, shape, color and condition of the pieces of cordage, paying special attention to cut, torn, crushed or burned edges.

**6.5.3** Examine the ends of the pieces of cordage to determine how the cordage was severed (e.g. cut, burned, torn).

**6.5.4** Document the diameter (and length, if pertinent), type of cordage (twisted or braided) and note any knots that are present, if pertinent.

**6.5.5** Document the number of crowns or turns per inch, the number of plies and braids, and the direction of twist ("S" or "Z") for the entire piece of cordage and for each ply or braid.

**6.5.6** Determine if two pieces of cordage can be physically matched to one another.

**6.5.6.1** Look for individualizing characteristics on the ends of the cordage such as a paper core or jagged plastic edges.

**6.5.6.2** If the cordage has a paper or fabric core, open the core so that it lays flat on the workspace.

**6.5.6.3** Using gross characteristics such as irregular contours, different types, sizes and colors of yarns, design patterns and stain patterns, attempt to orient the pieces of fabric to one another.

**6.5.6.4** Once the cores are oriented using gross characteristics, begin to compare individual cores to one another. If the core is fabric, ensure that the "long" yarns in one fabric coincide with a "short" yarn in the other piece of fabric. Continue comparing each yarn along the entire cut or torn edges. If the core is paper, compare the cut and/or torn edges to one another along the entire length of the core.

**6.5.6.5** If no differences can be found between the two pieces of core, then it can be concluded that the two pieces of core, and therefore the pieces of cordage, physically match one another.

**6.5.6.6** Diagrams and/or photographs of the two pieces of cordage together will be made and retained in the notes.

**6.5.6.7** If two pieces of cordage physically match one another, then they must also be alike with respect to color, construction and composition. Therefore, it can be concluded that the two pieces of cordage were once joined along their severed ends, and no additional examinations are necessary. If a physical match cannot be affected, continue with the examination.

**6.5.7** If two pieces of cordage cannot be physically matched to one another, determine if the two pieces of cordage exhibit the same color, construction and composition.

**6.5.7.1** Remove a measured section (e.g., one inch) from a logical area (not near the end, a knot, etc.), and tape the remaining cut ends together and mark them appropriately. Use this "section" for determination of construction and composition.

**6.5.7.2** Document if the piece of cordage has a core or a tracer. If so, describe the construction of the core or tracer and document this in the case notes.

**6.5.7.3** Analyze and identify the fibers comprising each piece of cordage utilizing the procedures in TEU Forensic Fiber Examinations.

**6.5.7.4** Repeat these steps for each piece of cordage.

**6.5.7.5** If no differences are observed between the pieces of cordage utilizing the appropriate techniques outlined above, it can be concluded that the pieces of cordage are consistent with originating from the same source or another source exhibiting the same color, construction, and composition.

## **6.6 Fabric, Fabric Damage, Fabric Impression, Duct Tape and Cordage Confirmations**

Fabric, fabric damage, fabric impressions, duct tape and cordage associations are confirmed by a second qualified examiner. These confirmations are documented by the signature of the confirming examiner and the date of the confirmation on the TEU Confirmation Form.

## **7 Calculations**

Not applicable.

## **8 Uncertainty of Measurement**

Not applicable.

## 9 Limitations

The type of information which can be developed as a result of fabric, fabric impression and cordage examinations is dependent on the type of evidence received and the condition of the evidence.

## 10 Safety

10.1 While working with physical evidence, laboratory personnel will wear appropriate protective attire (at a minimum, laboratory coat and gloves).

10.2 Universal precautions will be followed.

10.3 No specific hazards are associated with the examination techniques performed.

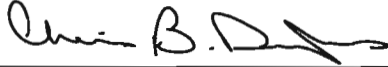
## 11 References

- Hatch, Kathryn L., Textile Science, West Publishing Company, Minneapolis/Saint Paul, New York, Los Angeles, San Francisco, 1993.
- Reader's Digest Complete Guide to Sewing, The Reader's Digest Association, Inc. Pleasantville, New York, 1976.
- Cordage Directory, Published by the Cordage Institute, Hingham, Massachusetts, 1989.
- Registered Numbers & Wool Products Label Encyclopedia, The Salesman's Guide, A Unit of the Cahners Business Information, New Providence, New Jersey, 1998.

Rev. #	Issue Date	History
0	07/10/06	Original issue.
1	11/19/07	Section 1 Replaced “guidelines” with “procedures used in”. Section 2 Updated list. Section 5 Deleted. Sections 6.1 and 6.2 Combined and revised, renumbered subsequent sections. Section 6.2.4 Added “Document the results in the case notes.” Section 6.2.5 New. Sections 6.3.2 – 6.3.6.1 New. Section 6.4.3 Added parenthetical remark. Revised 6.4.4 – 6.4.7.5 Section 6.5 New. Section 10.1 Updated safety information.
2	10/29/12	Section 1 Updated scope to include Cordage. Reworded scope to clarify types of examinations document addresses. Section 2 Updated equipment used. Section 6.1.1 Updated referenced TEU Quality Document. Section 6.1.2 Reworded section for clarity. Section 6.1.10.3 Reworded section to indicate that fabric is examined as opposed to individual yarns. Section 6.1.10.4 Reworded section to clarify procedures used to reach a conclusion and updated conclusion that can be reached. Section 6.2.1 Updated referenced TEU Quality Document. Section 6.2.5 Updated conclusion wording when association found. Section 6.3 Added Fabric Damage section to document and renumbered subsequent sections. Section 6.4 Renumbered section. Section 6.4.1 Updated referenced TEU Quality Document. Section 6.4.2 Added “to determine color, construction and composition”. Section 6.4.4 Added “or no twist”. Section 6.4.6 Reworded conclusion for association if no differences are found. Section 6.5 Renumbered section. Section 6.5.1 Updated referenced TEU Quality Document. Section 6.5.7.5 Reworded conclusion for association if no differences are found. Section 6.6 Renumbered section and added “Fabric Damage” and “Fabric Impression” to the types of associations that are confirmed.

**Approval**

TEU Chief:



Cherise B. Dreyfus

Date: 10/26/2012

**QA Approval**

Acting Quality Manager:

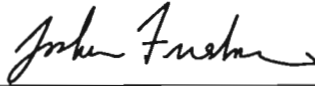


Marsha L. Karas

Date: 10/26/2012

**Issuance**

TEU QA Manager:



Joshua D. Friedman

Date: 10/26/2012